TABLE 2.—*Values of the solar constant of radiation. From bolographic studies.*

Date.	Hour angle. West.	Air mass.	Calories per square centimeter per minute.		Solar constant; for mean distance of the sun.
			At the earth's surface.	Outside the atmosphere.	
1902.	*h. m.*		*Calories.*	*Calories.*	
October 9	0 6	1.425	1.42	2.20	2.19
October 15	1 31	1.624	1.44	2.21	2.19
October 22	3 01	2.415	1.30	2.18	2.16
1903.					
February 19	1 01	1.642	1.35	2.34	2.28
February 19	2 22	2.003	1.20	2.31	2.25
March 3	0 59	1.429	1.34	2.31	2.26
March 25	2 01	1.454	1.19	2.29	2.27
March 26	1 57	1.438	1.16	2.11	2.10
March 26	2 59	1.754	1.05	2.09	2.07
April 17	2 45	1.463	1.19	1.97	1.99
April 28	1 07	1.145	1.29	2.23	2.27
April 29	2 26	1.308	1.05	1.93	1.97
General mean					2.167
Mean of results prior to March 26, 1903					2.229
Mean of results after March 26, 1903					2.080

general mean, the means also of observations before and after March 26, when, for some unexplained reason, a fall of about 10 per cent was noted in the computed solar constant. The observations of February 19,[5] March 25, 26, and April 29, 1903, appeared to be entitled to the greatest weight among those given, on account of the regularity of the actinometric curves of those days and the closeness with which the plotted points for determining the atmospheric transmission coefficients lie upon straight lines, as shown for two of the days in question on fig. 1.

FORM OF THE NORMAL SOLAR ENERGY SPECTRUM OUTSIDE THE EARTH'S ATMOSPHERE AND THE PROBABLE TEMPERATURE OF THE SUN.

The reader has no doubt noted that, by applying corrections for atmospheric and instrumental absorption, the bolographic spectrum energy curves may be reduced in form as well as in area to represent the distribution of energy in the spectrum of the solar beam outside the atmosphere. This has been done in several instances, and in doing so the curves have been transformed from the prismatic to the normal wave-length scale by taking account of the prismatic dispersion, and several of these curves are plotted on fig. 3 In these curves no account is taken of selective absorption bands, whether solar or terrestrial, smoothed curves only being given.

It will be noted that there is a fair agreement in general form between these independently derived curves, and that they unite in fixing the wave length of maximum energy at about 0.49 μ.[6] Their agreement would be more exact, there can be little doubt, if it were not for the large and variable absorption of the silvered surfaces in the optical apparatus for wave lengths at and beyond the region of maximum energy. The transmission of the spectroscope at a wave length of 0.45 μ has varied on this account at different times from 33 per cent to 15 per cent, whereas at wave lengths of 1 μ and thereabouts the transmission always approaches 90 per cent. The spectroscope mirrors are resilvered about once in two months and the siderostat mirrors still oftener.

Wien has derived a law connecting temperature with wave length of maximum radiation, which is expressed as follows, where T is the absolute temperature and λ_{max} the wave length of maximum intensity of radiation expressed in microns:

$$\lambda_{max} T = \text{constant.}$$

The value of this constant for the radiation of a "black body" or perfect radiator as determined by Paschen,[7] Lummer and Pringsheim,[8] and others is about 2900, while for bright platinum Lummer and Pringsheim give 2630 with values for other substances intermediate between these.

Taking the higher value in connection with the observed position of maximum in the solar energy curve outside the atmosphere, we find that as regards the wave length of maximum radiation the sun's radiation may be assumed comparable to the emission of a "black body" at 5920° absolute. Readers will draw their own conclusions as to the probability that the solar temperature actually lies near this value. It may be remarked that a further correction of the energy spectrum curve for the selective absorption of the solar envelope would undoubtedly reduce the wave length of maximum radiation still further, and would thus incline us to the view that the interior of the sun is at a higher temperature than the above considerations alone would indicate.

TREES AS FORECASTERS OF RAIN.

By CURTIS J. LYONS, Honolulu, Hawaii, dated October 15, 1902.

With respect to the query on page 315 of the MONTHLY WEATHER REVIEW for June, 1902, as to whether leaves of trees and shrubs turn up their lower sides previous to rain, the fact is this: A steady wind does not cause the leaves to turn in this way, because the leaves adjust themselves on the twigs of the tree or shrub to the wind in that particular direction. But a sudden change in wind seems to take the leaves unawares, and they immediately show their undersides until they become accustomed to the new direction. That is exactly what takes place before a thunderstorm. A change from trade wind to southerly or westerly wind here always shows the under side of the leaves. Curiously enough a sudden gust while the writer was reading the note in the WEATHER REVIEW gave an instance of the very thing in question.

CLIMATOLOGY OF COSTA RICA.

Communicated by Mr. H. PITTIER, Director, Physical Geographic Institute.

[For tables see the last page of this REVIEW preceding the charts.]

Notes on the weather.—On the Pacific slope, the rainfall was exceptional for the season, with strong northerly winds and much dampness. In San José, pressure and humidity were normal, with a slightly lower temperature; after the 8th it rained most of the time, with a heavy and cold northeast wind. Sunshine one hundred and one hours against a normal of one hundred and fifty-eight hours. The instability of the weather delayed the coffee picking, and the strong and damp winds, quite unusual at this time of year, were very prejudicial to the public health. On the Atlantic slope the rainfall was excessive, causing everywhere inundations and landslides. The only way of communication with Port Limon, i. e., the Costa Rica Railroad, has been interrupted for a distance of 13 miles, and has suffered many other damages.

Notes on earthquakes.—December 16, 10^h 36^m a. m., slight shock NW.–SE., intensity II, duration 3 seconds. Another slight earthquake was reported from Tres Rios on the 20th.

THE POLAR AURORA OF OCTOBER 30-NOVEMBER 1, 1903.

Communicated by JAMES PAGE, United States Hydrographic Office, dated Washington, December 14, 1903.

During the night of October 30–31, and again during that of October 31–November 1, observers aboard vessels in higher latitudes report having witnessed remarkable displays of the aurora borealis or northern lights. The phenomenon was observed in both the Atlantic and Pacific oceans. (See the report of the steamship *Victoria* given below.) Its occurrence was not simultaneous throughout, different observers recording the appearance and disappearance of the lights at different instants of absolute

[5] February 19, 1903, was the most extraordinary day as regards absence of water vapor in the atmosphere which has ever been noted here. The great water-vapor bands ϕ ψ in the infra-red spectrum were nearly filled up, and the long wave length side of the band Ω presented an almost unrecognizable appearance.

[6] The wave length of maximum energy determined by Mr. Langley on Mount Whitney was about 0.52 μ.

[7] Paschen, Astrophysical Journal, IX, 306, 1899.

[8] Verhandlungen d. Deutschen Phys. Ges. III, 37, 1901.